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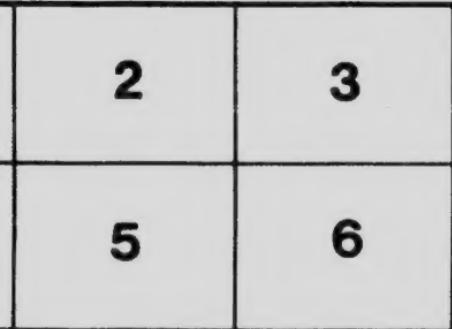
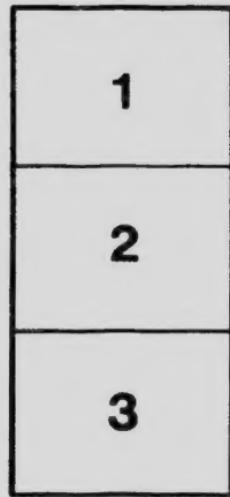
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## RADIUM AND ITS ACTION ON CERTAIN DISEASES

BY DR. W. H. B. A.

Radium was discovered in Paris by M. and Mme. Sklodowska Curie in 1898.

In 1901 the action of radium was observed by accident to M. Becquerel, who imbedded a small piece of radium in his vest pocket. Two days later the skin lying beneath the radium had been resting was found to be discoloured, and M. Besmir attributed it to radium.

P. Curie then made a voluntary exposure to the radium rays, and the experience was conclusive as to the action of radium on the skin, and thinking that the properties of radium had a therapeutic value he confided a sample to M. Danlos, professor of physiotherapy at the Sorbonne Hospital. This was the point of departure for the use of radium in physiotherapy, and to-day the qualities of radium as a therapeutic agent are fully established.

As a result of earnest work on the part of Dr. Louis Pasteur, a dermatologist of great note, physiotherapy was introduced into Paris, and also at the surgical clinics of the Sorbonne and the Laboratory for Radium in Paris.

There are many workers who have contributed to the establishment of this Laboratory. It was in 1903 when Dr. Wickham took charge that the first great scientific men to bear upon the subject personally and in collaboration with him were Dr. Curie and Dr. Pasteur. Through the principle of radium rays which is now well known, the danger incident to its use has been eliminated, and it is now possible to regulate the rays acting on the skin with greater accuracy. In the hands of competent men the value of this therapy is now firmly established on a firm basis. Dr. Wickham has

\* Read at meeting of the Section of Medical Physics, November 1903.

WITH  
Dr. W. H. B. AIKINS,  
*Committee.*

## CONNECTION WITH THE SKIN.\*

S., TORONTO.

1898 by Prof. Pierre Curie in cooperation with M. Bemont. It was made manifest by a curious fact that he constantly carried a small tube containing radium for several hours. Fourteen days later he found a pocket where the radium had been placed in acute state of inflammation due to the action of the radium.

He then made an experiment on himself, and found that after a few hours the burning action of the radium could be felt. When it would be found that the radium could be used in medical application he turned his attention to the St. Louis Hospital, and opened a new branch of medicine dealing with the use of radium as a valuable therapeutic agent.<sup>1</sup>

After careful researches carried on by Dr. Curie and Dr. Siekham, a trained scientist, he turned his attention to St. Lazare Hospital, Paris, under the direction of M. Cazin and M. Banzet, which hospital had been established in 1905.

Dr. Curie had not been using radium before 1898, but a new era dawned with the discovery of radium. He work and brought his knowledge to other competent observers. His investigations made the use of radium much safer. The danger of radium has been reduced, and since he has been using radium in the treatment of tissues, the working basis of his work has been laid. Hundreds of trained and competent agents have been placed at his disposal. He has published his premier paper in

## RADIUM AND ITS ACTION.

the *Annals of Dermatology*, October, 1906, on "Some Notes on the Employment of Radium as a Therapeutic Agent."

In the spring of 1907 I had the opportunity of visiting the Laboratory, and found much of surprise and interest, and met Dr. Louis Wickham. He consented to write a paper for THE CANADIAN PRACTITIONER AND REVIEW, which was published in the September issue, 1907, on "The Use of Radium in Skin Diseases."

Again in 1908 I visited the Laboratory, where careful research work was being conducted, and where Dr. Wickham and Dr. Degrais had obtained unquestionable and durable cures.

At first Dr. Wickham undertook to observe thoroughly the effects of bromide of radium on epithelial tumors of the skin, on the superficial cancers of the eyelids, nose and ears, in tuberculosis of the skin and in lupus. In such cases he had encouraging results. But when he undertook the treatment of port wine stains, naevi, vascular tumors and keloids he obtained results little short of marvellous, the disappearance of the tumor, the return of the tissue to normal or almost normal color without the formation of cicatricial tissue and without the destruction of the integument.

In September of this year I again spent three weeks in Paris and once more availing myself of Dr. Wickham's courtesy, frequently visited the Laboratory, and observed the methods employed in treating the patients who crowded the waiting-rooms.

In the early days the apparatus employed was not entirely satisfactory, a tube being mostly used, but by a special varnish made by M. Danne the radium salt is now fixed on a flat metal plate or stiff linen. This varnish is permeable to all the radium rays and resists the action of mild heat, water and most antiseptic solutions, but may be destroyed by emersions in either alcohol or chloroform.

In form the metal plates are square or oblong, though the round ones were formerly used. Care is taken that each centimetre of surface has one centigram of the salt pure or diluted with barium sulphate so as to reduce the radioactivity.

This apparatus has a radioactivity of 500,000, with a centigram of 25% of bromide of radium, incorporated with barium sulphate on a centimetre surface.

It is important to know the force, quality and quantity of the rays which penetrate into the tissues. There are three distinct types of rays. The alpha rays constitute about 90 per cent. of all the rays, and are positively electrified particles. The beta

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rays, which are the most spectacular and consist of negatively charged particles resembling the cathode rays produced by an electric discharge inside of a highly exhausted vacuum tube, are divided into three classes, the soft, the medium and the hard. These rays are emitted in great preponderance. The gamma rays are few in number. They in many respects resemble very penetrative X-rays, are uninfluenced by magnetism, and pass in straight lines at great speed, and possess remarkable penetrative properties, being able to influence a photographic plate through a foot of iron.

The rays emanating from the apparatus may be modified in strength and character by the interposition of "screens" between the radium and the surface to be acted upon. These may be of aluminum, mica, lead, glass and black paper. Muslin is sometimes used as a protective covering, but what is better is rubber cloth, which satisfactorily protects the varnish surface from moisture and septic secretions. By means of these screens the alpha and beta rays may be cut off.

Using an apparatus such as I now show you, with the interposition of lead, sheets of paper, and tied up in rubber cloth, the surface may be irradiated by the gamma rays exclusively.

As screen<sup>2</sup> after screen of increasing grades of thickness and density is interposed, first the alpha and soft beta rays will be cut off and absorbed in the medium beta, then the hard beta. Thus in each case the number of rays having the power to filter through the screens is in decreasing quantity. The rays in proportion to their number will have greater and greater powers of penetration; thus the quality of the radium is changed, because the average of its penetrative power is increased. As the rays diminish in number in proportion as the screens increase in thickness, it is easy to understand that the duration of the application must play a very considerable part, and that this duration must be increased in length in proportion as the rays are diminished in number, and from this fact the following three general rules of treatment can be deduced:

1. Apparatus applied naked. Rays numerous; special action on the surface; duration of application short.
2. Apparatus with interposition of medium filter. Rays less numerous; action on a greater thickness of tissue; duration of application longer.
3. Apparatus with interposition of thick filter. Rays very few; action on a very great depth of tissue; duration of application very long.

As mentioned, the tubes were formerly much used. A

modification of these tubes and the manner in which they are to be utilized has been perfected by Dr. Dominici. This series of tubes, when in their metal case, can be linked together in the form of a chain, or to appear star-like, or as a triangle or otherwise, and arranged so as to conform to the surface of the tumor to be treated. But the flat surface instrument is the one now used in the Paris Laboratory for application to cutaneous surfaces, and in order that the surface tissue of angiomatic tumors, swollen wine stains and other lesions to be acted on should not be injured, screens are employed as above noted to exclude the beta rays, which are apt to produce inflammatory action. With this end in view Drs. Wickham and Degrais devised several methods of procedure, among which is that of the "Feu Croise," or cross fire.

This method consists in applying to the tumor several apparatuses placed opposite to one another two by two, for a shorter time than that for which each of the apparatuses would cause a surface irritation. By this method all the rays act, both the very penetrating ones and those less so, with multiplication of the former and without surface reaction. The length of the application is reduced and also the duration of the treatment. The apparatus may be employed naked or covered with any of the series of screens as the requirements of the case demand.



FIGURE 1.

Fig. 1.<sup>3</sup> This illustrates an angiomatic tumor on the forehead of a babe seven months old. It was soft, violet-red in color, full of blood. It could by pressure be reduced one-fifth in size,

but pressure on the tumor caused pain, and when the child cried it took on a deeper color.

This tumor was treated by the "cross fire" method. The first treatment was made on 22nd March. On the 15th April a crust was forming at the periphery of the tumor, showing the result of inflammatory action. By the 3rd May the tumor had diminished to about one-half its size. Between the 6th and 30th of May nine further applications were made. During June and July radium was again used, and about the last of August the cure was completed.

Dr. Wickham writes:<sup>4</sup> "Frequently we combined this 'cross fire' method with the 'filtering' method, and by these means were enabled to witness the dissolution of tumors, the disappearance of the throbbing as well as the loss of color of the angioma, which, after their giving way, have sometimes retained a surface contrasting only slightly in tint with the healthy tissues in the same region.

"But the specific action of radium is not limited to cancerous and angiomatic tumors. There is another variety of tumors, the Keloidan, which also derive benefit from it. In fact, without visible reaction, enormous cheloids may be made smooth, and the truly turgid appearance of certain complicated scars made by keloids disappear, to be replaced by a flat, scarred surface, much easier to conceal. Moreover, the specific action of radium has caused much of the pain which ordinarily accompanies cheloids to disappear.

"Our later observations have merely strengthened our first conclusions. In fact, it is without determining the secondary inflammatory reaction that these affections must be treated. By applications of very short length, from one to three minutes a sitting, with a large and powerful apparatus, we found ourselves able to cure, without irritation, localized pruritus and superficial neuralgias, especially that which follows the shingles. Here is an example:

"A baby a year old was suffering from a bad case of priginous eczema, which, to its parents' great despair, had spread over its whole face and scalp. For six months without any success I treated it vigorously by the ordinary means. The baby cried without ceasing, and slept badly. I decided to use radium. M. Degrais applied our powerful apparatus of exterior radio activity, 580,000 and six centimetres in diameter, on each place the first day for one minute and a half, and for the same time on the following day. A fortnight later the mother wrote us that her baby was completely well."

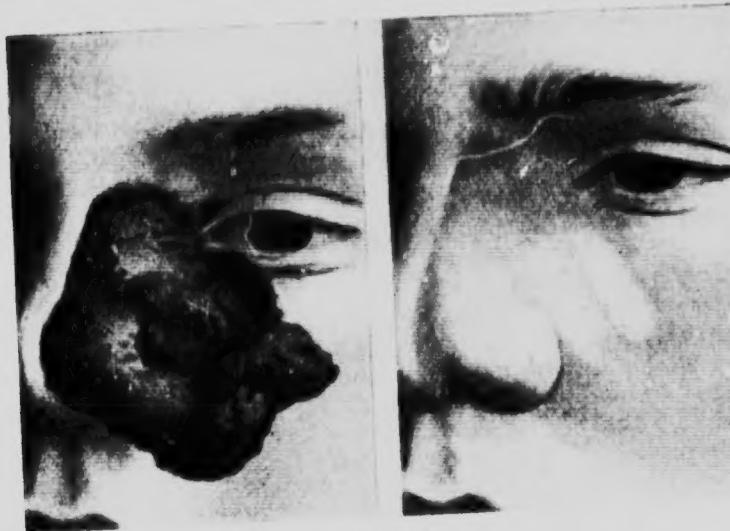


FIGURE 2.

Fig. 2.<sup>5</sup> This represents a large pigmentary tumor on the face of a child 11 years old. Its surface was ridged and of a yellowish brown color; it gave to the face a repulsive appearance. Application of radium was made for five hours on each place during three days. This produced an ulcerative reaction, which was followed by cicatrization. In two months the tumor had diminished fully one-half in size. Other applications were made for several hours on three consecutive days. Reaction was severe, but terminated rapidly. Additional applications had to be made from time to time. Three months after the completion of the treatment the tumor had entirely disappeared. The surface is now level and smooth, but there is some coloration of the tint of *café au lait*, and at two points the tissue is somewhat blanched.

Fournier<sup>6</sup> has been investigating the claims of Wickham and Degrais in regard to the complete cure of vascular naevi under the action of radium, and found that their claims are substantiated. He says that the cure of extensive naevi without a trace of disfiguring scars renders the method destined to supplant all other technics where the cosmetic effect is of importance. A slight ulcerative action seems to be required for flat superficial naevi, while deeper ones require stronger action. Prominent projecting naevi are best treated by weak doses, frequently

repeated, which act without inducing appreciable reaction. There is no destruction of tissue to leave a defect, but the tissues are modified and repair proceeds normally, leaving a smooth, regular surface, somewhat paler than the surrounding tissue, but otherwise normal. The naevus loses its color after the reaction, from six weeks to two months approximately. For angiomatic naevi the exposures are short but frequently repeated, with longer or shorter intervals of suspension at the first sign of reaction. The entire course of treatment in this form may require several months.

Nagalschmit<sup>7</sup> confirms the remarkable efficacy of radium treatment of naevi, which he says is far surpasses in effect and convenience to the patient any other measure known. With pure 100% radium bromide a flat capillary naevi is exposed from five to six minutes, cyanotic naevi ten minutes, and protuberant naevi from fifteen to twenty. After nine days a brownish pigmentation is noticed, with slight exudation and scab formation, followed by local infiltration and superficial desquamation for several weeks.

About the fifth week the naevus gradually assumes the characteristics of normal skin.

He does not mention that he had employed screens between the pure radium and the skin, and consequently the soft beta rays may have created a greater degree of inflammatory action than would have occurred had the Wickham method been adopted.

Cancers which have been cured or benefitted by radium are numerous. Epithelial cancers, superficial ulcerative or non-ulcerative epitheliomas with dry surface, cutaneous ulcerations which show the character of malignancy and a tendency to extension—rodent ulcer—epithelial cancers which have undergone large surface ulceration, cancers of the mucous membrane, keloids, angiomatic tumors, pigmentary naevi, tuberculosis of the skin, eczemas, psoriasis, angiokeratoma, lichen planus, acne rosacea, syrosis, syphilis, varicose ulcers, papilloma, vegetations. In lupus also some appreciable advance has been made.

Radium has also been used with benefit in certain cases of exophthalmic goitre, and the gynecologists of Paris are now making use of it in selected cases of cancer, uterine fibroids, uterine hemorrhages and metritis.

Radium may be said to rank as a "specific" in a certain sense, because erratic cell growths which constitute some types

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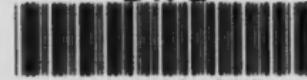
of tumor tissue are particularly sensitive to the rays.

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